

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 31.

April, 1929.

No. 364.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF
HARVARD UNIVERSITY.—No. LXXXIII.

(Continued from page 49.)

IV. THE REPRESENTATIVES OF *ELEOCHARIS PALUSTRIS* IN NORTH AMERICA.

M. L. FERNALD AND A. E. BRACKETT.¹

(Plates 181–184.)

PROBABLY no group of the *Cyperaceae* in the flora of temperate North America has been more baffling to the student of local floras than the complex of plants which have passed as *Eleocharis palustris* (L.) R. & S. The present study of the group, begun in 1925, has been much interrupted and often quite discouraging, especially from the fact that plants superficially very similar have obviously different achenes and tubercles; it has consequently been necessary, before roughly classifying our plants, to study the achenes of each, and in too many instances the specimens are immature or sterile. Our study started as an attempt to get a clearer insight into the representatives of *E. palustris* in New England, eastern Canada and New-

¹ AMELIA ELLEN BRACKETT (1896–1926), born at North Berwick, Maine, October 4, 1896, died at Boston, Massachusetts, May 31, 1926. Miss Brackett graduated from Radcliffe College in 1920 and received her master's degree from Radcliffe in 1921. At the time of her sudden and fatal illness (appendicitis) she was preparing to present herself for the doctorate. Miss Brackett had been temporarily employed as nomenclator at the Harvard Botanic Garden, as botanical artist at the Gray Herbarium, and at the time of her death she was general assistant in the herbarium of the Arnold Arboretum. Her capacity as a young systematist is shown in her revision of *Hypoxis* and studies of related genera, published in RHODORA, xxv. nos. 296 and 297 (1923); and her skill as an artist is demonstrated in those papers and in various plates contributed to RHODORA and other botanical journals.

The detailed measurements of the achenes, scales, sheaths, etc., summarized in the present paper, were made by Miss Brackett, but some of the drawings illustrating them were left incomplete. These have been generously put into form for publication by Dr. Henry K. Svenson.

foundland, but it has gradually broadened to cover all North America. In this work we have depended upon the material in the Gray Herbarium and the herbarium of the New England Botanical Club, supplemented by the very helpful material in the National Herbarium of Canada, loaned by Dr. Malte, the collection (rich in old specimens as well as new) of the Philadelphia Academy, loaned through Dr. Pennell, and specially selected and critical specimens from the New York Botanical Garden, loaned by Dr. Rydberg. To all the gentlemen who have so generously aided us we here express our appreciation and thanks.

As a result of the present study we are recognizing in North America eight species and two varieties which have passed as *Eleocharis palustris*. It has naturally been a problem, what to select as best standing for the Linnean *Scirpus palustris*, since Linnaeus's species was a complex. Long ago *Eleocharis uniglumis*, with the basal glumaceous scale spathiform, was separated off and European botanists have consistently treated *E. palustris* as a plant with 2 or 3 empty basal scales. More recently, Harald Lindberg, Acta Soc. pro Fauna et Fl. Fennica, xxiii. no. 7 (1902), has made a thorough study of the plants of northern Europe and has retained as *Scirpus palustris* the plant with firm subterete culms and elongate tubercles, distinguishing as a new species, *S. mamillatus*, the plant with soft compressed culms and low and broad tubercles and recognizing as a distinct species *S. uniglumis*. In view of this clear differentiation of the three species of northern Europe it is undoubtedly best to accept Lindberg's definition of *Scirpus* or *Eleocharis palustris*, which we have accordingly done. All three of the species of northern Eurasia, *E. palustris*, *E. mamillata* and *E. uniglumis*, are in North America, the first and third crossing the continent, the second (*E. mamillata*) seeming to be inseparable from the plant of the western half of the continent described, one year after *E. mamillata*, as *E. macrostachya* Britton.

In North America the *Palustres* are more complex than in Eurasia. A fourth Asiatic species, *E. kamtschatica*, crosses over to Alaska; another species, wide-ranging in North America, *E. calva* Torr., occurs also in eastern Asia and on the Hawaiian Islands; but the remaining species are, so far as known, strictly North American. One, *E. Smallii* Britton, originally recognized only from the Susquehanna valley, proves to be a widely distributed and highly variable

American species; the other two, here proposed as new, are confined to the region west of the Mississippi, one of them of wide range in the arid region west to Nevada and southward into Mexico, the other as yet known only from a limited area in northern California.

The results of our study are embodied in the following synopsis, with plates illustrating the essential points of the different species and varieties recognized.

- a. Basal scales of spikelet usually 2 or 3 below the thinner fertile scales: culms 0.5–5 mm. in diameter (in dried material) at summit of the upper sheath. . . . b.
- b. Tubercle elongate, much longer than broad: achenes 1.2–2.1 mm. long, narrowly obovoid or pyriform: culms subterete, rather firm. . . . 1. *E. palustris*.
- b. Tubercle depressed-deltoid, umbonate or broad-ovate, as broad as or broader than long: achenes 1.2–1.6 mm. long, roundish or broad-obovoid. . . . c.
- c. Culms firm or wiry, subterete: fertile scales loosely ascending, narrowly ovate to lanceolate, mostly acute or attenuate. . . . 2. *E. Smallii*.
- c. Culms soft, flat or compressed: fertile scales appressed, ovate, obtuse or subacute. . . . 3. *E. mamillata*.
- a. Basal scales solitary, spathiform, usually completely encircling the base of the spikelet: culms from filiform to 2 (rarely 3) mm. in diameter at summit of the upper sheath. . . . d.
- d. Culms terete or subterete, scarcely rigid: scales usually purple, reddish or purple-tinged. . . . e.
- e. Tubercle lanceolate or conical to broadly deltoid or depressed, much shorter than the achene. . . . f.
- f. Spikelets closely many-flowered: fertile scales often 40 or more, scarious-membranaceous, opaque, commonly brown or rufescent: achenes 1–1.4 mm. long: tubercles 0.2–0.45 mm. broad. . . . g.
- g. Culms filiform, 0.5–1.5 mm. in diameter: spikelets 0.9–1.7 cm. long: fertile scales oblong to ovate; the lower and median 1.8–3 mm. long. . . . 4. *E. calva*.
- g. Culms stout, 1–3 mm. in diameter: spikelets 2–4 cm. long: fertile scales lanceolate; the lower and median 4–5 mm. long. . . . 5. *E. perlonga*.
- f. Spikelets loosely few-flowered: fertile scales 5–30, firm-membranaceous to subcoriaceous, commonly lustrous and castaneous or dark-purple; the lower and median 3–5 mm. long: achenes 1.2–1.8 mm. long: tubercle 0.2–1 mm. broad. . . . 6. *E. uniglumis*.
- e. Tubercle ovoid, nearly equalling to larger than the achene, spongy and punctate: spikelets castaneous, loosely few-flowered. . . . 7. *E. kamtschatica*.
- d. Culms flattened, rigid: scales whitish or stramineous, with brownish stripes. . . . 8. *E. xyridiformis*.

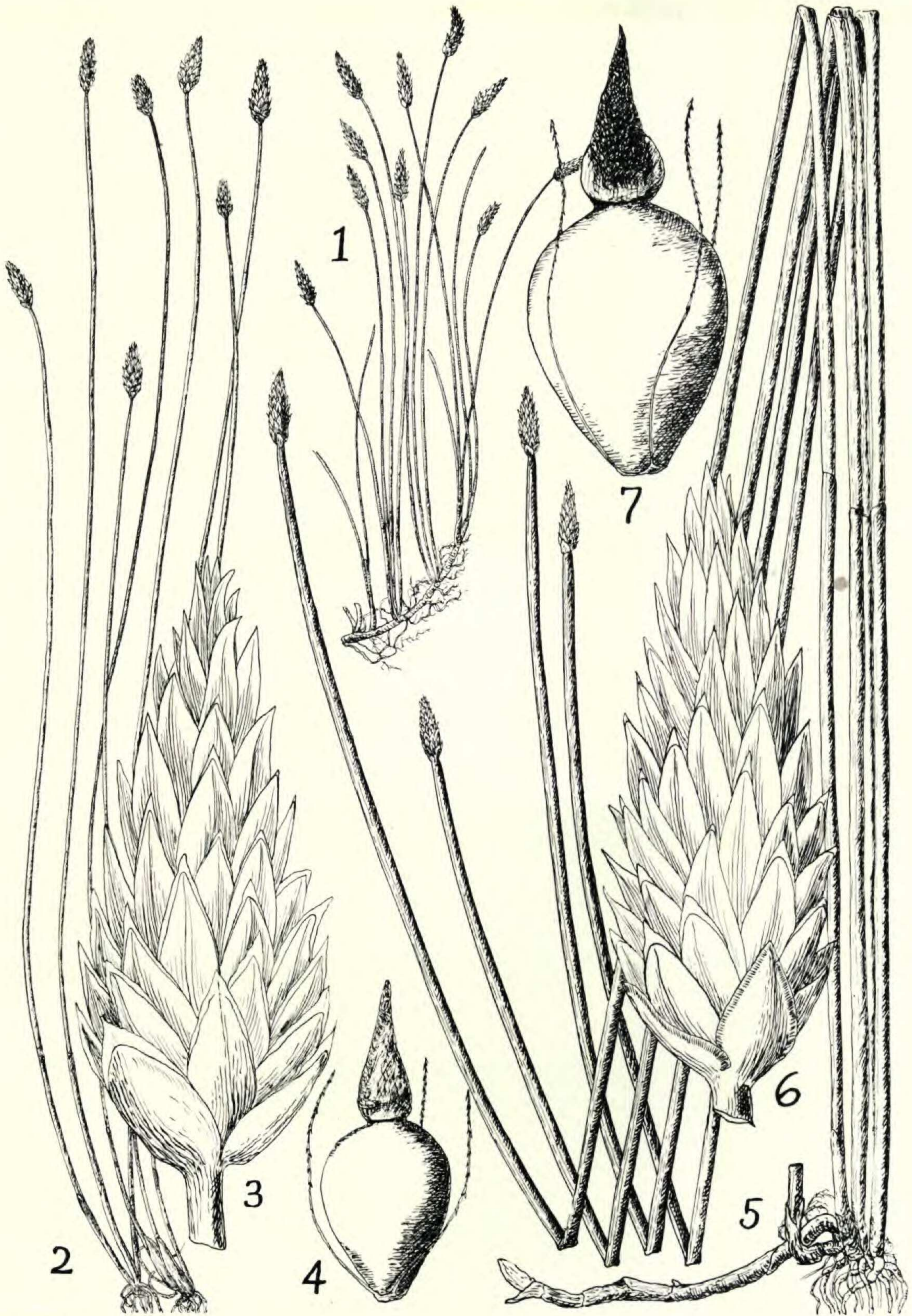
1. *E. PALUSTRIS* (L.) R. & S. Loosely stoloniferous to subcespitose, commonly (probably always) with widely creeping rootstocks: culms commonly terete, rarely a little compressed, firm but scarcely rigid, 0.1–1.9 m. high, from nearly filiform to stout, 0.5–5 mm. in diameter at the summit of the upper sheath: sheaths red or brown,

0.2–3 dm. long, rather loose: *spikelet* linear-cylindric to slenderly ovoid, 0.5–2.6 cm. long, 2.5–7 mm. thick, *closely many-flowered*: *the 2 or 3 basal scales firm*, ovate to oblong, obtuse: *fertile scales oblong-ovate, obtuse to subacute*, thin or membranaceous, *reddish-brown*, opaque, with pale scarious margin; the lower and median 3–5.5 mm. long: anthers 1.7–3 mm. long: *achenes obovoid to pyriform*, yellowish to castaneous, 1.2–2.1 mm. long, 0.8–1.6 mm. broad: *tubercle lanceolate to conic-ovoid or slenderly bulbiform, much higher than broad*, 0.3–0.8 mm. broad at base: perianth of 4 bristles commonly reaching the tubercle, sometimes shorter or wanting. FIGS. 1–7.

Represented with us by the two formal varieties:

Culms 1–4 dm. high, 0.5–2 mm. in diameter: lower and median fertile scales 3–4 mm. long: achenes 1.2–1.7 mm. long. Var. *typica*.
Culms 0.5–1.9 m. high, 1.5–5 mm. in diameter: lower and median fertile scales 3.2–5.5 mm. long: achenes 1.4–2.1 mm. long. Var. *major*.

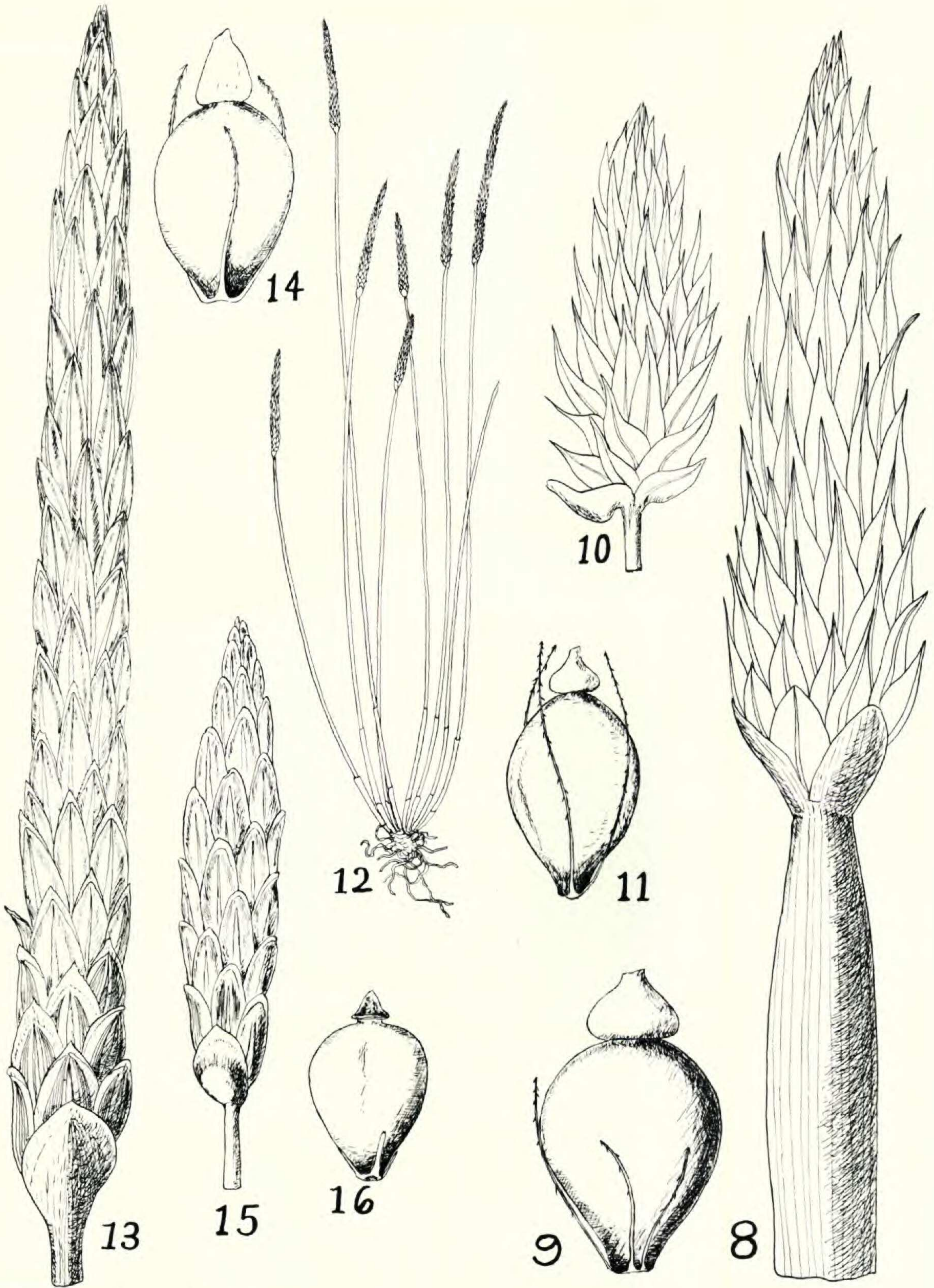
Var. TYPICA Rouy, Fl. de Fr. xiii. 361 (1912) as *Heleocharis*. *Scirpus palustris* L. Sp. Pl. i. 47 (1753). *S. eupaluster* Lindb. fil. Acta Soc. Faun. Fl. Fenn. xxiii. no. 7: 4 (1902). *E.* (as *Heleocharis*) *eupalustris* Lindb. fil. l. c. 5 (1902). *S. palustris*, *a. typicus* Aschers. & Graebn. Syn. Mitteleur. Fl. ii. Ab. 2: 290 (1903), which see for further synonymy. *Trichophyllum palustre* (L.) Farwell, Rep. Mich. Acad. Sci. xv. 166 (1913).—Culms 1–4 dm. high, 0.5–2 mm. in diameter at summit of the upper sheath: spikelet broad-lanceolate or ovoid, often castaneous, 0.5–2 cm. long, 2.5–6 mm. thick: lower and median fertile scales 3–4 mm. long: anthers 1.7–2 mm. long: achenes 1.2–1.7 mm. long. FIGS. 1–4.—Eurasia; and Newfoundland and the Labrador Peninsula to British Columbia, south to northern New England, northern Michigan, North Dakota and along the mountains to Wyoming, Idaho and Oregon. The following are representative American specimens. NEWFOUNDLAND: pools in limestone barrens, Cape Norman, *Wiegand, Griscom & Hotchkiss*, no. 27,519; in dead water near tide-limit, East Brook, St. Barbe Bay, *Wiegand & Hotchkiss*, no. 27,521; bushy swale on flat north of Doctor Hill, *Fernald & Wiegand*, no. 27,520; shallow pool, Port Saunders, *Fernald, Wiegand & Kittredge*, no. 2702; wet meadow, Pointe Verte, Placentia, *C. S. Williamson*, no. 806. QUEBEC: Blanc Sablon, July 29, 1915, *C. W. Townsend*; muddy edge of pond, Pointe au Maurier, Charney, *St. John*, no. 90,178; slough in sand-dunes, Natashquan, *St. John*, no. 90,175; open springy places in arbor vitae swamp, New Richmond, August 1, 1904, *Fernald, Collins & Pease*; Little Metis, July 26, 1906, *Fowler*; meadows and swamps south and east of Bic, *Fernald & Collins*, no. 922. NEW BRUNSWICK: Nepisiguit Grand Falls, *Malte*, no. 119,811; Lac Baker, *W. R. Watson*, no. 119,818. MAINE: marly bog, Monticello, *Fernald & Long*, nos. 12,797, 12,798; sandy river-margin, Dover, June 28, 1894, *Fernald*; ditches, North Berwick, June 16, 1894, *Parlin*. NEW HAMPSHIRE: edge of



A. E. Brackett del.

ELEOCHARIS PALUSTRIS

FIGS. 1-4, var. TYPICA; 5-7, var. MAJOR.



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ELEOCHARIS

FIGS. 8-11, *E. SMALLII*; 12-14, *E. PERLONGA*; 15 and 16, *E. CALVA*.

Fish Pond, Columbia, *Pease*, no. 16,739; Lime Pond, Columbia, *Fernald & Pease*, nos. 16,716, 16,719; sphagnum, Alstead, *Fernald*, no. 257. VERMONT: Willoughby, June 23, 1892, *Kennedy*; miry pool east of Hotel, Willoughby Lake, July 11, 1900, *Brainerd*; shore of Lake Champlain, Highgate Springs, May 28, 1880, *E. S. Hoar*. UNGAVA: Fort George, July 26, 1887, *J. M. Macoun*. ONTARIO: wet places, Blackwater River, Lake Nipigon, July 8, 1884, *J. Macoun*; Lake Superior, July 19, 1869, *J. Macoun*. MICHIGAN: Little Iron River, *Gillman*, no. 50. SASKATCHEWAN: without definite locality, 1858, *Bourgeau*; Spur Creek, *J. Macoun*, no. 16,375; Moose Jaw, *J. Macoun*, no. 16,373. NORTH DAKOTA: wet soil, Leeds, July 2, 1906, *Lunell*. ALBERTA: Jaspar, *Malte*, no. 108,024. IDAHO: wet meadow, Corral, Blaine County, alt. 1740 m., *Macbride & Payson*, no. 3824. WYOMING: meadow, North Pilot Butte, 1878, *C. Richardson*; Black Rock Springs, *A. Nelson*, no. 3725 (as *Carex teretiuscula*). OREGON: near Grizzly Butte Camp, Crook County, alt. 1040 m., *Leiberg*, no. 304; Swan Lake Valley, Klamath County, *Applegate*, no. 768. WASHINGTON: Kittitas County, alt. 600 m., *Sandberg & Leiberg*, no. 705; Grand Coulee, *Griffiths & Cotton*, no. 502; meadow, Granville, *Conard*, no. 352. BRITISH COLUMBIA: Donald, *J. Macoun*, no. 28.

Typical *Eleocharis palustris* (FIGS. 1-4), as shown by the European descriptions and plates, is a low plant, uniformly treated by the recent European botanists as rarely if ever exceeding 4 dm. in height. In Europe the extremely small plants, only 1 dm. or less in height, are sometimes separated as *E. palustris*, var. *arenaria* Sonder and var. *minor* Coss. & Germ. The small plant, which is essentially boreal in America, is often very glaucous and the name *E. palustris*, subvar. *glaucescens* (Willd.) Coss. & Germ. (1845) is often applied to it. Whether this is the true *Scirpus glaucescens* of Willdenow we are unable to determine. As pointed out, in the discussion of *E. uniglumis*, Willdenow's species was said to have flattened culms and 3 style-branches, although Asa Gray and others have identified it with *E. palustris*.

Var. MAJOR Sonder, Fl. Hamb. 22 (1851). *E. palustris*, a *aquatilis* Schur, Enum. Pl. Transs. 690 (1866). *Scirpus palustris*, var. *major* Baumg. acc. to Schur, l. c. (1866). *S. pal.*, forma *Casparyi* Abromeit, Schrift. d. Physik. Oekonom. Gesellsch. Königsb. xxix. 88 (1889). *E. pal.*, var. *vigens* Bailey in Britton, Journ. N. Y. Microsc. Soc. v. 104 (1889). *E. crassa* C. A. Meyer ex Meinsh. Acta Hort. Petrop. xviii. 262 (1901). *S. crassus* C. A. Meyer ex Meinsh. l. c. (1901). *Trichophyllum palustre*, var. *vigens* (Bailey) Farwell, Rep. Mich. Acad. Sci. xxi. 358 (1920). *E. palustris* of most American auth.—Culms 0.5-1.9 m. high, 1.5-5 mm. in diameter at the summit

of the upper sheath: sheaths comparatively loose, 0.3–3 dm. long; spikelet lanceolate to ovoid, 0.7–2.6 cm. long, 2.5–7 mm. thick; lower and median fertile scales 3.2–5.5 mm. long; anthers 1.7–3 mm. long; achenes 1.4–2.1 mm. long, 1–1.6 mm. broad. FIGS. 5–7.—Shallow to comparatively deep water of sandy, gravelly or muddy lake- or pond-margins, river-banks or marshy shores, Labrador and Newfoundland to British Columbia, south generally to Pennsylvania, Michigan, Illinois, Iowa, South Dakota, Wyoming, Idaho and northern California. The following, selected from a large representation, are characteristic. LABRADOR: small lake near mouth of Mulligan River, Lake Melville, *Wetmore*, no. 103,127. NEWFOUNDLAND: Whitbourne, *Robinson & Schrenk*, no. 121; Tilt Cove, *Fernald, Wiegand & Darlington*, no. 4699; Rushy Pond, *Fernald et al.*, nos. 4697, 4698, 4700; Lookout Mountain, Bonne Bay, *Fernald & Wiegand*, no. 2707; Birchy Cove (Curling), *Fernald & Wiegand*, no. 2703; Sand Bank, west of Burgeo, *Fernald, Long & Fogg*, no. 110. QUEBEC: Brest, *St. John*, no. 90,176; Natashquan, *Victorin & Rolland*, no. 18,124; Rivière Mingan, *Victorin & Rolland*, no. 25,775; Rivière des Caps, Anticosti, *Victorin & Rolland*, no. 27,513; Rivière Cap Chat, *Fernald & Smith*, no. 25,496; Berthier-en-bas, *Rousseau*, no. 20,163; Lac St.-Jean, *Victorin*, no. 15,114; Black Lake, *Fernald & Jackson*, no. 12,032; Shawinigan Falls, August 1, 1923, *Chamberlain & Knowlton*; Ile Plate, near Montreal, *Victorin*, no. 731; Philipsburg, August 10, 1923, *Knowlton*. MAGDALEN ISLANDS: Pointe-de-l'Est, Ile de la Grande-Entrée, *Victorin & Rolland*, no. 9352. PRINCE EDWARD ISLAND: Lower Sea Cow Pond, *Fernald, Long & St. John*, no. 6953; Victoria Road, *J. Macoun*, no. 32,219. NEW BRUNSWICK: Bass River, Kent County, 1869, *Fowler*; Woodstock, *Fernald & Long*, no. 12,802; Hampstead, *Fassett*, no. 2187; Hammond, *Svenson & Fassett*, no. 2079. NOVA SCOTIA: Bay St. Lawrence, Cape Breton, August 14, 1904, *Churchill*; South Ingonish, *Nichols*, nos. 698 and 879; Sable Island, *J. Macoun*, nos. 22,648, 77,163, *St. John*, no. 1152; Five-Mile River, *Pease & Long*, no. 20,142; Block House, *Fernald & Long*, no. 23,374; Havelock, *Fernald & Long*, nos. 23,373 and 23,375; Cedar Lake, *Fernald, Bean & White*, no. 20,136; Beaver Lake, *Long & Linder*, nos. 20,134, 20,135; Yarmouth, *Howe & Lang*, no. 160; Salmon Lake, *Fernald, Bissell, Graves, Long & Linder*, no. 20,139. MAINE: Pettiquaggamas Lake, *Fernald*, no. 122; Winn, *Fernald & Long*, nos. 12,795, 12,796; Upper Stillwater, July 16, 1892, *Fernald*; Orono, *Fernald & Long*, no. 12,805; Kidney Pond, July 21, 1919, *Graves*; Charlotte, *Fernald*, no. 1383; Rockland, *Fernald*, no. 1389. NEW HAMPSHIRE: Lake Umbagog, Cambridge, *Pease*, no. 16,548; Stewartstown, *Pease*, no. 12,631; Willey Pond, *William Oakes*; Enfield Pond, July 28, 1890, *Kennedy*. VERMONT: West Danville, July 13, 1900, *Brainerd*; Franklin, July 16, 1916, *Knowlton*; Colchester, *Blake*, nos. 2100, 2439; Highgate Springs, August, 1873, *Jesup*; South Burlington, August 3, 1921, *Knowlton*; Athens, *Wheeler*.

MASSACHUSETTS: Topsfield (as a new but unpublished species), *Chas. Pickering* (herb. Phil. Acad.); Tewksbury, *Pease*, no. 2968; Jamaica Plain, June 28, 1878, *Faxon*; Eastham, *F. S. Collins*, no. 2307; New Marlborough, June 26, 1912, *Hoffmann*; Stockbridge, August 26, 1902, *Hoffmann*. CONNECTICUT: East Hartford, *Driggs*, no. 13; East Lyme, *Graves*, no. 222; Stratford, July 4, 1901, *Harger*. NEW YORK: Lake Harris, Essex County, *House*, no. 7349; Clear Lake, Adirondack Lodge, August 30, 1892, *Britton*; Morristown, *Fernald, Wiegand & Eames*, no. 14,186; Lewis Point, Oneida Lake, *House*, no. 14,220; Fisher's Landing, *Robinson & Maxon*, no. 82; Selkirk, *Fernald, Wiegand & Eames*, nos. 14,188, 14,189; Summit Marsh, Spencer, *Eames, Fernald & Wiegand*, no. 14,593; Cortland, *Eames*, no. 5911; Dryden, *Wiegand*, no. 19,424; Buffalo, *G. W. Clinton*; Seaford, Long Island, *Ferguson*, nos. 5605, 5914. NEW JERSEY: Nordhoff, *Dautun*, no. 18. PENNSYLVANIA: Long Pond, Pocono Mts., August 1, 1860, *Porter*; Tinicum, September, 1866, *Porter*; Luzerne County, July, 1896, *S. Brown*. UNGAVA: Fort George, July 26, 1887, *J. M. Macoun*. ONTARIO: Wolfe Island, July 8, 1860, *Wm. Boott*; Lake Nipigon, *J. Macoun*, no. 32,208; Port Arthur, July 6, 1888, *B. H. Smith*. MICHIGAN: Sault Ste. Marie, July, 1865, *Porter*; Port Huron, July 9, 1892, *Dodge*; near Lansing, July 28, 1898, *Bailey*; Indian River, August 8, 1890, *C. F. Wheeler*; Keweenaw Co., *Farwell*, nos. 675, 773. WISCONSIN: Green Bay, June, 1882, *Schuette*; Western Union Junction, Racine County, *Wadmond*, no. 3144. ILLINOIS: south of Thornton, Cook Co., June 9, 1897, *A. Chase*. MANITOBA: Churchill, *J. M. Macoun*, no. 79,220; Grand Beach, Lake Winnipeg, *Malte*, no. 106,701. IOWA: Story City, *Combs & Ball*, no. 439. SOUTH DAKOTA: Aberdeen, *Griffiths*, no. 853. ALBERTA: Red Deer, *Malte & Watson*, no. 119,810; Vermillion Lakes, *S. Brown*, no. 688. MONTANA: Big Fork, July 28, 1908, *Clemens*. WYOMING: Fort Bridger, August 6, 1873, *Porter*. COLORADO: Parlin, Gunnison Co., August 12, 1901, *B. H. Smith*. IDAHO: Lake Tesimini, *Heller*, no. 685; St. Anthony, *Merrill & Wilcox*, no. 793. UTAH: in herb. Phil. Acad. on a very mixed sheet occurs a label bearing the numbers 117 and 577, and the localities and dates, "Glenwood and Rabbitt Valley" and "May 27th and Aug. 15th, 1876," *L. F. Ward*. This label accompanies mixed material of *E. calva* and *E. palustris*, var. *major*; the latter is ripe, the former in anthesis. The specimen of *E. palustris*, var. *major* presumably came from Rabbit Valley, Aug. 15th. CALIFORNIA: Russian River, north of Cloverdale, July 9, 1902, *Heller*, no. 5828. OREGON: Narrows, *Griffith & Hunter*, no. 247; Juano Valley, *Griffith & Hunter*, no. 366; Chemawan, *Nelson*, no. 1204. WASHINGTON: western Klikitat Co., *Suksdorf*, no. 90; Grand Coulee, *Griffith & Cotton*, no. 452; Cow Creek, *Griffith & Cotton*, no. 523; Newport, *Kreager*, no. 453. BRITISH COLUMBIA: Victoria Road, Vancouver Island, June 20, 1887, *J. Macoun*; District of Renfrew, *Rosendahl & Brand*, no. 87; Kennedy

Lake, Vancouver I., *J. Macoun*, no. 78,801; Revelstoke, *J. Macoun*, no. 7375; Prince Rupert, *Malte*, no. 119,802.

2. E. SMALLII Britton, *Torreyia*, iii. 23, fig. 2 (1903).—Loosely stoloniferous to subcespitose: *culms firm or wiry*, subterete, very slender to rather stout, 0.5–2.5 (except in over-pressed material) mm. in diameter at the summit of the upper sheath, 2.5–9 dm. high: *spikelet* slenderly lance-attenuate to narrowly ellipsoid-ovoid, acute to obtusish, 0.5–2 cm. long, 2.5–5 mm. thick, *loosely-flowered*: the 2 or 3 basal scales narrowly ovate to oblong, obtuse: *fertile scales* in well developed spikelets *loosely ascending, with spreading-ascending tips* (closely imbricated only in poorly developed spikelets); the lower and median lanceolate to narrowly ovate, *acute, often slender-tipped*, 3–5 mm. long, *very thin and scarious*, with 2 purple convergent bands: anthers 1–1.8 mm. long: *achenes rounded-obovoid*, 1.2–1.6 mm. long, 0.8–1.2 mm. broad, yellowish to dark brown: *tubercle broadly ovate, as broad as or broader than long*, often somewhat depressed, about 0.4 mm. broad at base: perianth wanting or more commonly of delicate bristles reaching the tubercle. (FIGS. 8–11.)—Peaty and wet sandy swamps, shores and pond- and river-margins, southwestern Nova Scotia to Michigan and Nebraska, south to Delaware, Pennsylvania, Indiana, Illinois and Missouri. The following, selected from a large representation, are characteristic. NOVA SCOTIA: New Germany, *C. A. Hamilton*, in hb. Geol. Surv. Can., no. 80,822. Harper Lake, *Fernald & Long*, no. 23,376; Upper Wood's Harbor, *Fernald & Fassett*, no. 23,540; Salmon Lake, *Fernald, Bissell, Graves, Long & Linder*, nos. 20,140, 20,143; Butler's Lake, Gavelton, *Fernald, Long & Linder*, no. 20,144; Trefry's Lake, Arcadia, *Fernald & Long*, no. 20,170. NEW BRUNSWICK: Grand Menan, August, 1889, *J. I. Northrop*. MAINE: Foxcroft, *Fernald*, no. 302; Fairfield, *Fernald & Long*, no. 12,800; Torrey Pond, Deer Isle, *Hill*, no. 1982; Frankfort, *Fernald & Long*, no. 12,801; Bristol, *Chamberlain*, no. 408; Ocean Point, *Fassett*, nos. 439, 828; Woolwich, *Fernald & Long*, no. 12,806; Green, *Scribner*, no. 104; Wilson's Pond, Cumberland, *Chamberlain*, no. 624; Limington, *Fernald & Long*, no. 12,794. NEW HAMPSHIRE: West Stewartstown, *Fernald & Pease*, no. 16,941; Cherry Pond and Little Cherry Pond, Jefferson, *Pease*, nos. 14,453, 12,921; Alstead, *Fernald*, no. 257. VERMONT: Fifield Pond, August 4, 1901, *E. C. Kent*; Spectacle Pond, Wallingford, September 4, 1898, *Eggleston & Ross*; Peacham, June, 1881, *F. Blanchard*; Bowen Pond, Sunderland (alt. 763 m.), *Eggleston*, no. 2133. MASSACHUSETTS: Amesbury, 1900, *A. A. Eaton*; Lynnfield, June 17, 1879, *Young*; Swain's Pond, Melrose, June 17, 1879, *Young*; South Framingham, July 21, 1890, *Sturtevant*; Holbrook, June 18, 1899, *Williams*; Cooper's Pond, Carver, *Fernald, Hunnewell & Long*, no. 8888; Wewantet River, Wareham, *Fernald*, no. 820; Freetown, *Sanford*, no. 823; Pocasset, Bourne, *F. S. Collins*, nos. 2621, 2960; No Bottom Pond, Brewster, *Fernald*, no. 18,028; Sparrow Young's Pond, Chatham,

Fernald, no. 16,318; Provincetown, *Fernald & Long*, no. 18,029; Nantucket, July 7, 1885, *Redfield*; Springfield, August 20, 1903, *L. Andrews*; Monterey, July 12, 1912, *R. Hoffmann*. RHODE ISLAND: Cumberland, May 30, 1911, *R. A. Ware*; without statement of locality, *Olney*. CONNECTICUT: Lake Quassapaug, Middlebury, *Blewitt*, no. 1469; Southington, *L. Andrews*, no. 714; Waterbury, *Blewitt*, no. 491. NEW YORK: Lake Ronkonkoma, Long Island, *Ferguson*, nos. 2292, 5037; Big Long Pond, Sag Harbor, Long I., *Ferguson*, no. 5822; Kellis Pond, Bridgehampton, Long I., *Ferguson*, nos. 3930, 4902; Meadowbrook, Long I., *Ferguson*, no. 437; Winfield, Long I., *Ferguson*, no. 4952; New Dorp, Staten I., July 7, 1889, *Britton*; lake above Catskill Mt. House, Catskill Mts., July 15, 1893, *Shear*; Skinner's Creek, Sandy Creek Township, *Fernald, Wiegand & Eames*, no. 14,185. NEW JERSEY: New Egypt Pond, *J. H. Grove*, no. 570 $\frac{1}{2}$; Manahawken, July 22, 1907, *Long*; Delanco, August 17, 1907, *Van Pelt*; southwest of Clementon, June 12, 1864, *C. E. Smith*; Wildwood, September 10, 1909, *O. H. Brown*. PENNSYLVANIA: Pike Co., July 9–15, 1899, *Brown & Saunders*; Lily Lake, Luzerne Co., August 16, 1889, *Heller, Small*; Mount Bethel, September 2, 1907, *Long*; Rock Hill, June 21, 1908, *Van Pelt*; Byberry, 1866, *Martindale*; Wellsboro, July 7, 1869, *Garber*; Harnsburg, September, 1893, *Small* (TYPE); Safe Harbor, June 23, 1864 (coarse form), July 6, 1866 (slender form), *Porter*; McCall's Ferry, September 26, 1891, *Small* (one of original collections), July 1 and 3, 1904, *Crawford*. DELAWARE: Wilmington, June 25, 1897, *Commons*. MICHIGAN: Jackson, July 15, 1894, *S. H. Camp*. INDIANA: Goose Lake, Whitley Co., *Deam*, no. 31,222; Wahob Lake near Valparaiso, August 16, 1920, *Peattie*; Kankakee River, Thayer, *Deam*, no. 20,128; northwest of Grayville, *Deam*, no. 25,694. WISCONSIN: Sauk Co., 1861, *Hale*. ILLINOIS: near Wady Petra, *V. H. Chase*, nos. 614, 1450; Oquawka, June, 1873, *Patterson*. IOWA: Missouri Valley, *Pammel*, no. 418; Armstrong, June 29, 1897, *Cratty*. MISSOURI: St. Louis, May, 1845, *Engelmann*; Courtney, *Bush*, no. 2997; Webb City, *E. J. Palmer*, no. 2168; near Asbury, *E. J. Palmer*, no. 34,662; Emma, 1897, *Demetrio*. NEBRASKA: Dismal River, south of Thedford, *Rydberg*, no. 1485.

Eleocharis Smallii is quite as common as and often more abundant than *E. palustris* in the silicious and peaty soils of the eastern United States, reaching Canada only in the southwestern corners of Nova Scotia and New Brunswick, where it is associated with other southern species. It varies greatly in size, the coarse plants (FIGS. 8 and 9), such as were originally described by Britton, approaching the larger extremes of *E. palustris*, the slender extremes (FIGS. 10 and 11) being as small as *E. calva*. The culms are more firm and wiry than in our other species (in this character differing from *E. mamil-*

lata of western North America, which has softer and flattened culms but similar, though larger, achenes and tubercles). The fertile scales of the spikelet are remarkably narrow and tapering ordinarily to long acute tips; and most commonly the scales are pale except for the two dark and converging lines. In some extremes, as in the type-material, the spikelet is very slender and with appressed-ascending scales; in the opposite extreme (especially in slender plants) the spikelet is plump and the tips of the scales are free and not appressed. All attempts to separate these two extremes have thus far been futile, although the more slender and lower plants have slightly smaller achenes (FIG. 11).

3. *E. MAMILLATA* Lindb. fil. Acta Soc. Faun. Fl. Fenn. xxiii. no. 7: 7 (1902) and in Dörfler, Herb. Norm. no. 4383 (1902), as *Heleocharis*. *Scirpus (Heleocharis) mamillatus* Lindb. fil. Acta Soc. Faun. Fl. Fenn. xxiii. no. 7: 4, 7, t. I. figs. 1-18 (1902). *E. macrostachya* Britton in Small, Fl. SE. U. S. 184, 1327 (1903).—Resembling *E. palustris*; but with *soft compressed culms* (becoming very flat and ribbon-like under pressure), 0.2-1.2 m. high: *sheaths drab or pale brown*, usually red only at base: spikelets slenderly subcylindric to lanceolate, commonly tapering or acuminate above, 1-3 cm. long, 2-5 mm. thick at base: lower sterile scales 2 or 3, oblong or narrowly ovate: *fertile scales very numerous*, membranaceous, *pale-brown to purplish*, narrowly ovate, obtuse to subacute, appressed; the lower and median 2-4 mm. long: anthers 1.3-2 mm. long: *achene yellowish or pale-brown*, obovoid, 1.2-1.6 mm. long: bristles 5 or 6 (rarely 8), very delicate, often overtopping the tubercle, rarely wanting: *tubercle depressed-deltoid or umbonate*, as broad as high, sessile or essentially so. FIGS. 27-30.—Marshes, swales, ditches and wet shores, Illinois to British Columbia, south to Louisiana, Texas, Michoacan and southern California; Eurasia. ILLINOIS: Athens, Menard Co., *E. Hall*, as *E. compressa*; Salem, Marion Co., 1860, *Bebb*; St. Clair Co., June 4, 1878, *Eggert*. MISSOURI: St. Louis, July, 1846, *G. Engelmann*, as *E. compressa*; Buckner, *Bush*, no. 6780; Emma, June 25, 1897, *Demetrio*; Sibley, *Bush*, no. 4011; Kansas City, *Bush*, no. 1748; Prosperity, *E. J. Palmer*, no. 2149. LOUISIANA: Opelousas, *Carpenter*; "the commonest species in ditches," New Orleans, *Cocks*, no. 1555. NORTH DAKOTA: Leeds, *Lunell*, no. 7. NEBRASKA: Red Cloud, *J. M. Bates*, no. 2933. KANSAS: Riley Co., *J. B. Norton*, no. 546; Dickinson Co., *Hitchcock*, no. 973, as *E. compressa*; Wichita, *S. F. Poole*, no. 140. OKLAHOMA: without statement of locality, 1868, *Edw. Palmer* (type of *E. macrostachya*); Kenton, *Stevens*, no. 447. TEXAS: Terrell, Kaufman Co., May 13, 1904, *F. J. Tyler*; Dallas, *Reverchon*, no. 3600; Devil's River, Valverde Co., July 12, 1849, *C. Wright*, no. 712. IDAHO: Falk's Store, Canyon Co., *Mac-*

bride, no. 221. CALIFORNIA: Russian River, Mendocino Co., *Heller*, no. 5828; Shelter Cove, Humboldt Co., *Kellogg & Harford*, no. 1061; Chico, *Copeland*, no. 3182; Calaveras River, *E. E. Stanford*, no. 434; Yosemite Valley, *Abrams*, no. 4632; Santa Barbara, *Rothrock*, no. 155; San Bernardino, *Parish*, nos. 1185, 1186. WASHINGTON: Toppenish, Yakima Co., *Cotton*, no. 788; New London, Chehalis Co., *Lamb*, no. 1201. BRITISH COLUMBIA: Lake House, Skagit River, *J. M. Macoun*, no. 78,193; Depot Creek, Chilliwack Lake, *Spreadborough*, no. 78,192; east of Chilliwack Lake, *J. M. Macoun*, no. 34,773; vicinity of Nanaimo, *J. Macoun*, no. 78,800; Renfrew, *Rosendahl & Butters*, no. 87. DURANGO: vicinity of city of Durango, 1896, *Edw. Palmer*, no. 387. SAN LUIS POTOSI: "in paludosis circa urbem," *Schaffner*, no. 576. MICHOACAN: Rincon, *G. Arsène*, no. 2794, as *E. rostellata*.

Eleocharis mamillata is best distinguished by its very soft and flat or compressed culms and its small achenes with low and broad tubercle. It was presumably included by Linnaeus under his *Scirpus palustris*, but since Lindberg has set off the plant with soft culms and low tubercles, leaving to stand for *E. palustris* the plant with subterete and firmer culms and elongate bulbiform tubercles, it seems wisest to accept this differentiation. As recognized by Lindberg *E. mamillata* was known to be of general dispersal over northern Europe; in the Gray Herbarium it is represented from as far south as Saxony and some Japanese plants (immature) seem to belong to it. In North America the species belongs in the lower altitudes from the Mississippi basin into Mexico and along the Pacific slope north to southern British Columbia. Lindberg's figures of the achenes of the Scandinavian and Finnish plant are perfectly matched by the achenes of American specimens of *E. macrostachya* and authentic specimens of *E. mamillata* (FIGS. 27 and 28) are closely matched by characteristic American sheets (FIGS. 29 and 30) of *E. macrostachya*: the sheet of Lindberg's original distribution, no. 4383 of Dörfler's *Herbarium Normale*, later material collected by Lindberg and distributed as no. 158 in Kneucker's *Cyperaceae et Junaceae exsiccatae*, as well as Swedish material from Elias Fries and from Hülphers are so close to American specimens that I can find no satisfactory reason to separate the Eurasian and American plants. Some American sheets which are closest matches for European are *Eggert*, St. Clair Co., Illinois; *E. J. Palmer*, no. 2149; *Cocks*, no. 1555; *Stevens*, no. 447; *Lamb*, no. 1201; *J. M. Macoun*, no. 34,773; *J. Macoun*, no. 78,800. These are all plants with dark scales and

full spikelets; but I am unable to get any satisfactory distinctions between these specimens and others from the Mississippi basin westward with more slender spikelets or with paler scales.

4. *E. CALVA* Torr. Fl. N. Y. ii. 346 (1843). *Scirpus glaucus* Torr. Fl. No. and Mid. U. S. 44 (1824), not *E. glauca* Boeckl. (1871). *E. palustris*, var. *calva* (Torr.) Gray, Man. 522 (1848). *E. palustris*, var. *glaucescens* of many Am. auth., not *Scirpus glaucescens* Willd. (1809). *Trichophyllum palustre*, var. *calvum* (Torr.) Farwell, Rep. Mich. Acad. Sci. xxi. 358 (1920).—Loosely stoloniferous to slightly cespitose, with capillary or slender rhizomes and stolons: culms 1–6.5 dm. high, nearly filiform, 0.5–1.5 mm. in diameter at the summit of the upper sheath, terete or corrugated, rarely compressed: sheaths red or castaneous, very close; the upper 0.2–1 dm. long, 0.7–1.5 mm. in diameter: spikelet linear-lanceolate or slenderly ovoid, 0.9–1.7 cm. long, 1.5–4 mm. thick, closely many-flowered: basal scale orbicular to round-ovate, spatheform, completely encircling the bases of the lower fertile scales: fertile scales oblong to ovate, mostly obtuse, thin and membranaceous, reddish to pale brown, opaque, closely appressed; the lower and median 1.8–3 mm. long: anthers 1.3–1.7 mm. long: achenes pyriform or narrowly obovoid, yellowish to castaneous, 1–1.4 mm. long, 0.7–1 mm. broad: tubercle conical, 0.2–0.45 mm. broad at base: perianth wanting or of 1–4 delicate bristles usually equaling or slightly exceeding the tubercle. FIGS. 15 and 16.—Wet shores, bogs or springy spots, Quebec to Alberta and Washington, south to Florida, Oklahoma and northern Mexico; also Hawaii and eastern Asia. The following, selected from many specimens, are characteristic. QUEBEC: Rivière Ashuapmouchouan, Baie de St.-Prime, Lac St.-Jean, Victorin, no. 15,113; Pointe-Plate, près de Roberval, Victorin, no. 15,115; vicinity of Cap a l'Aigle, J. Macoun, no. 69,302; Lanoraie, Svenson & Fassett, no. 1031; shores of Caughnawaga, Victorin, no. 8115; Isle-aux-noix, Richelieu River, Victorin, no. 8116; beach of St. Lawrence River, Lachine, August 15, 1912, Churchill; Cascades environs d'Ottawa, Victorin, no. 10,284; Aylmer, Malte, no. 119,807; Caribou Hill, Black Lake, Fernald & Jackson, no. 12,031. NEW BRUNSWICK: Tidehead near Campellton, Malte, no. 119,813; St. Leonard, W. R. Watson, nos. 119,816, 119,817; tidal shores of the St. John, Upper Greenwich and Westfield, Fassett, nos. 2190, 2189. NOVA SCOTIA: McDonald's Barren, Northeast Margaree, Cape Breton, C. B. Robinson, no. 345. MAINE: Van Buren, September 11, 1896, Fernald; Old Town, July 16, 1892, Fernald; Orono, July 19, 1890, Fernald; Kennebec River, Fairfield, Fernald & Long, no. 12,799. NEW HAMPSHIRE: Connecticut River, Northumberland, Pease, no. 12,172; Enfield Lake, July 28, 1890, Kennedy; Connecticut River, Walpole, July 28, 1901, Williams. VERMONT: Knight's Island, Lake Champlain, July 12, 1899, Brainerd; L. Champlain, Burlington, Blake, no. 2076; Queechee Gulf, Woodstock, July 4, 1910, Kennedy;

Salem, July 22, 1914, *Churchill*; Manchester, *Day*, no. 240. MASSACHUSETTS: Glendale, August 10, 1904, *Hoffmann*. CONNECTICUT: Hartford, July 7, 1884, *C. Wright*. NEW YORK: Narrows Island, Black Lake, *Fernald, Wiegand & Eames*, no. 14,184; Blake Lake, Morristown, *Phelps*, no. 180; Sylvan Beach, Oneida Lake, September 4, 1906, *Rowen*; Slayton Pond, Conquest, *Wiegand*, no. 5913; marl ponds, Springport, *Eames*, no. 9332; North Spring, Union Springs, *Wiegand, Fernald & Eames*, no. 14,591; Enfield, *E. L. Palmer*, no. 184. NEW JERSEY: Palisades at Creskill, *Dautun*, no. 17; Milburn, June 24, 1894, *Livingston*; Hewett's Pond, north of Andover, July 2, 1907, *Brown & Van Pelt*; Newton, July 4, 1907, *Carter*; Cold Spring, Cape May County, May 27, 1906, *Van Pelt*; Peermont, Cape May County, June 14, 1908, *Van Pelt*. PENNSYLVANIA: on the Delaware and the Bushkill, Easton, many collections, *Porter*; Mount Bethel, June 28, 1908, *Bartram*; Wilt's Mill meadows along Trout Creek, Allentown, *Pretz*, nos. 485, 4702, 4780; meadow southwest of Trexlertown, *Pretz*, no. 5908; near old Lewis' Furnace, Allentown, July 5, 1912, *Hamm*, no. 1095; Rocky Island in Schuylkill River, West Manayunk, *MacElwee*, no. 556; Green Lane, June 21, 1905, *Van Pelt*; Embreeville, August 9, 1884, *Seal*; West Chester, *Pennell*, no. 372; Susquehanna River, York Furnace, *MacElwee*, no. 225; Safe Harbor, July 6, 1866, *Porter*; Ararat, July, 1900, *Saunders*; Ohio Pyle, *Brown, Crawford & Van Pelt*, no. 52. DELAWARE: Greenbank, August 13, 1879, *Commons*. MARYLAND: river-bed, Conowingo, *Pennell*, no. 1572. VIRGINIA: Wytheville, 1874, *Shriver*; northeast of Williamsburg, *Grimes*, no. 3708. SOUTH CAROLINA: Gough, *J. St. Clair White*. FLORIDA: without locality, *Chapman*. ONTARIO: Moose Factory, James Bay, 1882, *W. Haydon*; Rockcliffe, Ottawa, *Malte*, no. 119,803; Port Colborne, *J. Macoun*, no. 34,487; Amer, *J. Macoun*, no. 34,486; Galt, July 15, 1903, *Herriot*. OHIO: Cedar Point, Erie County, June 26, 1897, *Moseley*; Shalersville, Portage County, June 15, 1909, *Webb*; Columbus, 1839, *Sullivant*. INDIANA: Greencastle, June, 1893, *Underwood*. MICHIGAN: Alma, June 23, 1893, *C. A. Davis*; Chatham, 1902, *L. M. Geismar*. WISCONSIN: Oronto, July 30, 1868, *Gilman*; Green Bay, June 22, 1882, *Schuette*; Lake Michigan Beach, Racine, *Wadmond*, no. 3137. ILLINOIS: Stony Island, Cook County, *H. H. Smith*, no. 5931; Illinois River bottom, July and August, 1903 and 1904, *McDonald* (distributed as *E. intermedia*); Urbana, June 27, 1900, *Gleason*. TENNESSEE: along Cumberland River, Nashville, June, 1894, *Bicknell*. MANITOBA: Grand Beach, Lake Winnipeg, *Malte*, nos. 106,697, 106,700; Brandon, *J. Macoun*, no. 16,374. MINNESOTA: Mississippi River, Fort Snelling, *Means*, no. 693. IOWA: Clinton City, *G. D. Butler*, no. 18; Fort Dodge, *M. P. Somes*, no. 111; Iowa City, June 20, 1907, *Somes*. MISSOURI: Webb City, *E. J. Palmer*, no. 2169; London, *Lansing*, no. 2947. ARKANSAS: northwestern Arkansas, *Harvey*, nos. 7 and 36. NORTH DAKOTA: Devil's Lake, 1839, *Nicolet*; wet soil,

Leeds, June 19, 1906, *Lunell*; Butte, July 29, 1906, *Lunell*; Dickinson, August 19, 1908, *Holgate*. SOUTH DAKOTA: Sioux Falls, June 5, 1896, *T. A. Williams*; Lead City, *Rydberg*, no. 1074. NEBRASKA: low lands of the Missouri, northeastern Nebraska, *F. Clements*, no. 2552; Ashland, *T. A. Williams*. KANSAS: Pottawatomie County, *Norton*, no. 547; Cheyenne County, *Hitchcock*, no. 1051a. OKLAHOMA: Sellard's Pond, near Alva, *Stevens*, no. 251; Beaver County, *Stevens*, no. 372. SASKATCHEWAN: Eagle Creek, *J. Macoun*, no. 73,078; near Prince Albert, *J. Macoun*, no. 16,376. ALBERTA: Red Deer River, vicinity of Rosedale, *Moodie*, no. 890. MONTANA: Sinyale-a-min Lake, *MacDougal*, no. 373; Bozeman, August 23, 1905, *Blankinship*. WYOMING: Laramie, *Nelson*, no. 289; Lower Falls of the Yellowstone, July 26, 1871, *Hayden*. COLORADO: Delta, *Tidestrom*, no. 1509; Denver, May, 1881, *B. H. Smith*. UTAH: Farmington, June 17, 1908, *Mrs. Joseph Clemens*; Teller's Flat, Fish Lake, *Tidestrom*, no. 1845. NEVADA: along ditches, Caliente, *Tidestrom*, no. 9473 as *E. montana*. NEW MEXICO: Santa Fé Creek, *A. A. & E. G. Heller*, no. 3809. ARIZONA: Camp Grant, alt. 4753 ft., *Rothrock*, no. 380. MEXICO: San Luis Potosi, 1878, *Parry & Palmer*, no. 913. WASHINGTON: junction of Crab and Wilson Creeks, Douglas County, *Sandberg & Leiberg*, no. 323; Prosser, Yakima County, *Cotton*, no. 660; Grand Coulee, *Griffith & Cotton*, no. 446. HAWAII: Oahu, *U. S. Pac. Expl. Exped.* EASTERN ASIA: Amur, *Maximowicz*; central Amur, 1891, *Korshnisky*; Amur River, Manchuria, 1855, *Maack*, no. 524.

Eleocharis calva is the inland plant which has usually passed as *E. palustris* var. *glaucescens* or as *E. glaucescens*; but, as explained in the discussion of *E. uniglumis*, *E. glaucescens* rests upon *Scirpus glaucescens* Willd., which is merely a form of *E. palustris*. The only plant besides *E. uniglumis* (FIGS. 31 and 17-26) with which *E. calva* (FIGS. 15 and 16) is likely to be confused is the most slender extreme of *E. palustris* (FIGS. 1-4) but that has 2 or 3 basal scales and much longer, sharper and less appressed fertile ones and larger achenes and long tubercle. The eastern Asiatic specimens cited seem quite like ours but fuller material may show that the two are not identical.

5. ***E. perlonga***, n. sp., caespitosa; culmis 1.5-3.5 dm. altis teretibus vel subteretibus 1-3 mm. diametro; vaginis artis 2-5.5 cm. longis 1.5-3.5 mm. diametro ad basin brunnescentibus; spicula lineari-cylindrica 2.5-4 cm. longa 2.5-5 mm. crassa dense multiflora; squama inferiori spathiformi ovata 2.5-3 mm. longa coriacea; squamis fertilibus membranaceis lanceolatis vel anguste ovatis obtusis vel subacutis, imis mediisque 4-5 mm. longis margine late hyalinis; antheris 2 mm. longis; achaeniis subglobosis vel late obovoideis olivaceo-brunneis 1.4 mm. longis 1.1 mm. latis; tuberculo conico ad basin

0.45 mm. lato; setis 2–4 delicatulis tuberculum vix aequantibus. FIGS. 12–14.—CALIFORNIA: Aqua Fria Cañon, Mariposa County, June 20, 1897, *J. W. Congdon*, no. 88 (TYPE in Gray Herb.); vicinity of Ione, Amador County, June, 1904, *E. Braunton*, no. 1058 (herb. N. Y. Bot. Gard.).

Eleocharis perlonga may prove to be an extreme variation of *E. mamillata*, but in its broad and spathiform lower scale it seems to belong to the group with *E. uniglumis*, *E. calva* and *E. xyridiformis*. The material at hand is very inadequate and it is to be hoped that fuller collections can be made.

Another plant of which very inadequate material is at hand is represented only by over-ripe culms (without caudex). This plant (*Burt Davy*, no. 3288), from wet, adobe meadows, Honey Lake Valley, Lassen County, California, strikingly resembles the most slender extreme (FIGS. 10 and 11) of the eastern *E. Smallii* and its bruised spikelets seem to have 2 or 3 basal sterile scales. Its achenes and tubercles are scarcely separable from those of *E. perlonga*. Fuller and slightly younger material may show it worthy special designation; it is likewise possible that it may be a very slender *E. palustris*, var. *typica*.

6. *E. UNIGLUMIS* (Link) Schultes, Mant. ii. 88 (1824). *Scirpus uniglumis* Link, Jahrb. d. Gew. i³: 77 (1820). *Clavula uniglumis* (Link) Dumort. Fl. Belg. 143 (1827). *E. affinis* C. A. Meyer, Beitr. z. Pflanzenk. Russ. Reich. viii. 261 (1851). *E. Watsoni* Bab. Ann. Mag. Nat. Hist. ser. 2, x. 20 (1852). *Scirpus paluster*, subsp. *S. uniglumis* (Link) Aschers. & Graebn. Syn. Mitteleur. Fl. ii. ab. 2: 291 (1904). *S. palustris*, var. *uniglumis* (Link) Junge, Jahrb. Hamburg. Wissenschaftl. Anstalt. xxv. Beih. 3: 248 (1908).—Loosely stoloniferous or cespitose, with the rhizomes and stolons capillary or very slender: culms 0.3–7 dm. high, 0.3–3 mm. in diameter at the summit of the upper sheath, *terete* or corrugated, rarely subcompressed: sheaths mostly reddish at least at base, close; the upper 0.8–8.5 cm. long: spikelets lanceolate to slenderly ovoid, 0.3–1.7 cm. long, 2–6 mm. thick, loosely 5–30-flowered: basal scale orbicular or round-ovate, spathiform, completely clasping the base of the spikelet, castaneous, with pale scarious margin: fertile scales oblong-ovate, obtuse to subacute, commonly castaneous or purplish, subcoriaceous to firm-membranaceous, lustrous; the lower and median 3–5 mm. long: anthers 1.5–2.2 mm. long: achenes obovoid, pyriform or somewhat ellipsoid, yellowish to dark brown or olive, 1.2–1.8 mm. long, 1–1.4 mm. broad: tubercle from depressed-deltoid to conic-ovoid or lanceolate, 0.2–1 mm. broad at base: bristles wanting or very delicate and short or sometimes elongate but scarcely overtopping the tubercle. FIGS. 31 and 17–26.

A variable circumpolar species with two somewhat marked varieties with us:

Achenes ellipsoid to narrowly obovoid: the tubercle depressed-deltoid to low-conical, often as broad as high, 0.6–1 mm. broad at base, covering $\frac{1}{2}$ – $\frac{3}{4}$ the breadth of the achene. Var. *typica*.
 Achenes broadly obovoid or pyriform: tubercle bulbiform, slenderly conical to lanceolate, commonly higher than broad, 0.2–0.5 mm. broad at base, covering $\frac{1}{6}$ –rarely $\frac{1}{2}$ the breadth of the achene. Var. *halophila*.

Var. **typica**. *Scirpus uniglumis* Link, l. c. (1820). *E. uniglumis* (Link) Schultes, l. c. (1824). FIG. 31.—Basic, calcareous or alkaline shores and marshes, Labrador to British Columbia, south locally along the coast to Rhode Island and inland to North Dakota, Wyoming and Oregon; Greenland and Eurasia. The following American collections are referred here. LABRADOR: brackish margin of Paradise River, Sandwich Bay, *H. Bishop*. NEWFOUNDLAND: small pools on diorite tableland, alt. 550 m., Blomidon Mts., *Fernald & Wiegand*, no. 2706. QUEBEC: brackish shore, Chevalier, *St. John*, no. 90,179; tidal mud at mouth of River Shécatica, Brouague, *St. John*, no. 90,180; estuary of R. Etamaniou, Charnay, *St. John*, no. 90,181; sables près de l'embouchure, R. Romaine, *Victorin & Rolland*, no. 20,165; Murray River, *J. Macoun*, no. 69,301; vicinity of Cap à l'Aigle, *J. Macoun*, no. 69,301. MASSACHUSETTS: peaty margin of Sheep Pond, Cuttyhunk, *Fogg*, no. 2526. RHODE ISLAND: damp sandy shore of Wash Pond, Block Island, *Fernald, Hunnewell & Long*, no. 8887. HUDSON BAY: without definite statement of locality, *Burke*. MANITOBA: boggy place, Brandon, *J. Macoun*, no. 16,374. NORTH DAKOTA: St. Mary's Lake, *Mabbott*, no. 225. SASKATCHEWAN: Crane Lake, *J. Macoun*, no. 7551, as *E. acuminata*; Long Lake, July 6, 7, 8, 1879, *J. Macoun*, nos. 5, 50, 300; muskeag north of Prince Albert, *J. Macoun*, no. 16,377 in part (as *E. tenuis*). WYOMING: wet alkali soil, Point of Rocks, *Merrill & Wilcox*, no. 708. OREGON: Alkali Lake, Klamath Co., *Applegate*, no. 843; junction of Crab and Wilson's Creeks, Douglas Co., *Sandberg & Leiberg*, no. 323. WASHINGTON: Westport, Chehalis Co., *F. H. Lamb*, no. 1103. BRITISH COLUMBIA: beach, Alberni Canal, *Rosendahl*, no. 1922; seashore, Point Grey, June, 1898, *R. B. Dixon*.

Var. **halophila**, n. var., achaeniis late obovoideis vel pyriformibus; tuberculo conico vel lanceolato ad basin 0.2–0.5 mm. lato. FIGS. 17–26.—Saline and brackish shores, southern Newfoundland and south shore of the St. Lawrence to Delaware; also central New York. The following are typical. NEWFOUNDLAND: brackish estuary at the Narrows, Port à Port, July 25, 1921, *Mackenzie & Griscom*, no. 10,106; border of brackish pool, Stephenville Crossing, August 14, 1910, *Fernald, Wiegand & Kittredge*, no. 2705; marsh on coast, Bay St. George, August 12, 1908, *Eames & Godfrey*, no. 5884; brackish sand back of Sand Bank, west of Burgeo, September 9,

1926, *Fernald, Long & Fogg*, no. 109. ST. PIERRE ET MIQUELON: marécages, Plaine de Miquelon, 22 juillet, 1901, *Arsène*, no. 86. QUEBEC: brackish shores about mouth of Dartmouth River, August 26 and 27, 1904, *Collins, Fernald & Pease*; platières du delta de la Rivière York, July 16, 1923, *Victorin et al.*, no. 17,060; brackish marshes at mouth of Bonaventure River, August 2-4, 1904, *Collins, Fernald & Pease* (TYPE in Gray Herb.); border of salt marsh, Capucins, July 28, 1922, *Fernald & Pease*, no. 24,914; Anse à Persil, Rivière du Loup, July, 1913, *Victorin*, no. 104. MAGDALEN ISLANDS: wet brackish sand, Étang du Nord, Grindstone Island, July 24, 1912, *Fernald, Bartram, Long & St. John*, no. 6959; sable humide de la dune, Ile du Hâvre-au-Ber, *Victorin & Rolland*, no. 9358; margins of small ponds among the sand hills, Pointe du Loup, July 21, 1912, *Fernald, Bartram, Long & St. John*, no. 6957; étangs sablonneux, Grand Étangs, Ile de la Grande-Entrée, August 1, 1919, *Victorin & Rolland*, no. 9347; étangs sur la dune, Ile Brion, August 4, 1919, *Victorin & Rolland*, no. 9349. PRINCE EDWARD ISLAND: salt marsh, Green's Shore, Summerside, July 21, 1912, *Fernald & St. John*, no. 6955; shore of Cozen's Pond, August 29, 1912, *Fernald, Long & St. John*, no. 6958; boggy ground, Brackley Point, June 28, 1888, *J. Macoun*, no. 32,199; dune-hollows, Brackley Point, August 31, 1912, *Fernald, Long & St. John*, no. 6960. NEW BRUNSWICK: shore of bay, Bathurst, August 16, 1913, *Blake*, no. 5452; salt meadow, Shediac Cape, August 7, 1916, *Hubbard*; brackish meadow, Whitehead Island, Charlotte County, August 5, 1926, *C. A. & U. F. Weatherby*, no. 5501. NOVA SCOTIA: Sable Island, *J. Macoun*, nos. 22,640, 22,647, 77,185-77,187; *St. John*, nos. 1153-1155; damp sand-flats back of beach, Villagedale, August 7, 1920, *Fernald, Long & Linder*, no. 20,147; brackish muddy and gravelly margin of Eel Lake, July 27, 1920, *Fernald, Bean & White*, no. 20,145. MAINE: shallow water between the heath and the salt marsh, base of West Quoddy Head, Lubec, July 26, 1909, *Fernald*, no. 1385; brackish marsh, Baker's Island, July 15, 1898, *Rand*; boggy meadow, Swan's Island Head, Swan's Island, July 22, 1913, *Hill*, no. 735; pool in rocks, Thunder Gulch, Isle au Haut, July 21, 1921, *Kidder*; brookside, Matinicus, July 18, 1921, *C. A. E. Long*; brackish pool, Outer Heron Island, Boothbay, August 30, 1922, *Fassett*, no. 434; among tall grass, Wells Beach, July 23, 1898, *Fernald*. NEW HAMPSHIRE: Hampton Falls, August 11, 1897, *A. A. Eaton*. MASSACHUSETTS: Oak Island, July 9, 1882, *Young*; salt marsh, Neponset River Reservation, June 14, 1920, *Kidder*; salt marsh, Fairhaven, July 15, 1904, *Hervey*; Woods Hole, July 20, 1911, *Pennell*, no. 3009; fresh to brackish springy border of Dinah's Pond, Yarmouth, August 16, 1919, *Fernald & Long*, no. 18,022; salt marsh, Doane Creek, Harwich, July 6, 1918, *Fernald*, no. 16,319; springy border of salt marsh, Red River, Chatham, August 8, 1919, *Fernald & Long*, no. 18,027; sandy shore of Tashmoo Lake, Tisbury, September 5, 1917, *Seymour*, no. 1496;

sandy pond-margin, French Watering Place, Naushon, July 14, 1925, *Fogg*, no. 1028; Madsquecham Pond, Nantucket, September 2, 1904, *Bicknell*. RHODE ISLAND: border of brackish pool, Westerly, August 31, 1919, *Weatherby & Collins*; dune-hollows between Chagum Pond and Wash Pond, Block Island, August 22, 1913, *Fernald, Hunnewell & Long*, no. 8889. CONNECTICUT: salt marsh, Orange, June 20, 1899, *Bissell*. NEW YORK: salt marshes, Long Island, *Wm. Darlington*; brackish marsh, Southampton, August 2 and 3, 1920, *St. John*, no. 2598; brackish sandy shore, Great Pond, Montauk, July 7, 1923 and August 8, 1924, *Ferguson*, nos. 2603, 3168; Coney Island, July 4, 1893, *Thos. Seal*; salty spots in meadows northeast of Montezuma Village, Cayuga County, June 25, 1919, *Wiegand, Eames & Randolph*, no. 11,428. NEW JERSEY: shore of Newark Bay, Bergen Point, June 18, 1893, *Thos. Seal*; Deal, August 6, 1866, *A. H. Smith*; Long Beach, June, 1848, *Bischoff*; south of Maxon's Pond, Point Pleasant, July 7, 1910, *Van Pelt & Brown*, no. 277; salt meadows, Atlantic County, July, 1873, *Seal*; Cold Spring, May 27, 1906, *Van Pelt*; marsh toward the Bay shore, Dias Creek, August 11, 1903, *Long*. (The material from Cape May is not quite typical, having unusually depressed tubercles and a tendency toward two instead of a single basal scale, thus approaching *E. Smallii*). DELAWARE: marshes near Slaughter Beach, July 16, 1896, *Commons*; salt marshes and moist places in sand-dunes, near Cape Henlopen, July 14, 1898, *Commons*.

Eleocharis uniglumis is one of the plants which has been passing in America as *E. palustris*, var. *glaucescens* (Willd.) Gray or as *E. glaucescens* (Willd.) Schultes. The original description of *Scirpus glaucescens* Willd. Enum. Pl. Hort. Berol. 76 (1809) calls for a plant with culms a foot-and-a-half or more in height, the basal sheaths loose, the styles trifid. In studying Willdenow's herbarium Asa Gray made the manuscript memorandum: "*glaucescens!* (spec. cult. but very poor) nothing to do with *S. tenuis*, but certainly *S. palustris!* I wonder Kunth did not find it out. Pretty large and stout, with more slender younger culms, barren intermixed"; and at the same time he noted that *S. uniglumis* "looks good." One of the few old sheets in the Gray Herbarium bears Gray's determination: *E. uniglumis*; this clearly indicating that at first Gray did not consider it identical with *E. glaucescens*, although in several editions of the *Manual* he so treated it. Ascherson & Graebner consider *E. glaucescens* merely a glaucous form of *E. palustris* and Rouy treats it as a glaucescent subvariety of *E. palustris*.

The more northern material, from the Labrador Peninsula, Hudson Bay and westward seems quite inseparable from the Eurasian

plant, with low and broad tubercle (FIG. 31). Southward along the Atlantic coast var. *halophila* (FIGS. 17-26) is commonly well defined, so clearly in most cases that we were at first inclined to consider it a distinct species. Too many collections, however, show tubercles in shape inseparable from those of typical *E. uniglumis* but not quite so broad, these collections making a perplexing transition between the two extremes. Some of the collections from southern New England and from Cape May are particularly difficult to place, since their tubercles so strongly approach those of the usually more boreal *E. uniglumis*, var. *typica*. It is possible that they have some admixture of *E. Smallii*, which has low and broad tubercles.

A plant of the Great Plain region, with cespitose habit, rigid culms and pale scales may eventually be separated from *E. uniglumis*. At present the material at hand is too meagre for confident decision.

On account of its single basal glume *Eleocharis calva* (FIGS. 15 and 16) might be mistaken for *E. uniglumis*. In general they are quite distinct and *E. calva* occurs in river-silts and other habitats with neutral or slightly calcareous but not strongly alkaline soil; *E. uniglumis* preferring the more concentrated calcareous or alkaline shores.

The range of variation of achenes and tubercles of European *Eleocharis uniglumis*, var. *typica* is well displayed in the study by Harald Lindberg, Acta Soc. Faun. Fl. Fenn. xxiii. no. 7, t. II. figs. 36-56; Dr. Svenson's illustration (FIG. 31) accompanying the present paper shows a characteristic achene. The broadly obovoid achene of var. *halophila* strongly suggests that of the Eurasian and western American *E. mamillata*, but the tubercle of thoroughly characteristic var. *halophila* is more like that of *E. palustris*, mostly longer than broad and varying to lance-ovoid or in extremes to lanceolate and the achene is larger than in *E. mamillata*.

7. *E. KAMTSCHATICA* (C. A. Meyer) Komarov, Fl. Penins. Kamtsch. i. 207 (1927). *Scirpus kamtschaticus* C. A. Meyer, Mém. Acad. Imp. Sc. St. Pétersb. Div. Sav. i. 198, t. 1 (1831). *E. pileata* Gray, Mem. Am. Acad. n. s. vi. 417 (1859), in part. *S. mitratus* Franch. & Savat. Enum. Pl. Jap. ii. 544 (1879). ? *S. sachalinensis* Meinsh. Acta Hort. Petrop. xviii. 260 (1901). *E. Savatieri* Clarke in H. Lévillé, Bull. Acad. de Géog. Bot. xiv. 203 (1904), name only, Kew Bull. Add. Ser. viii. 21 (1908) and Ill. Cyp. t. xxxvi. figs. 15-18 (1909).—Loosely stoloniferous: culms tufted, filiform, 0.3-3 dm. high, 0.5-1 mm. in diameter at summit of the upper sheath, terete: sheaths reddish, close; the upper 0.6-8 cm. long: spikelet oblong-lanceolate, 4-12 mm. long, 2.5-5 mm. broad, loosely few-flowered: